

**NATURAL RESOURCES CONSERVATION SERVICE
Wyoming
CONSTRUCTION SPECIFICATIONS
FOR
IRRIGATION WATER CONVEYANCE
HIGH PRESSURE UNDERGROUND PLASTIC (LARGE DIAMETER)**

(Owner/Operator)

(Project/Title)

GENERAL

This specification covers the installation and materials for high-pressure plastic pipe larger than 18-inch diameter. Pipelines shall be installed in accordance with a design and plan approved by the responsible technician. Details of construction shown in the design and plan but not included here shall be considered as a part of this specification. Construction activities shall be in accordance with applicable OSHA regulations.

TRENCH CONSTRUCTION

Trench width at any point below the top of the pipe should be only wide enough to permit the pipe to be easily placed and joined and to allow the initial backfill material to be uniformly placed under the haunches and sides of the pipe. The minimum trench width shall be 24 inches greater than the pipe diameter for mechanical compaction and not less than 18 inches greater than the pipe diameter for water saturated compaction. The maximum trench width should be no greater than 36 inches wider than the diameter of the pipe. Trench banks that are more than 5 feet high shall be shored or sloped. Refer to Figure 1 for typical trench details.

Where rock, hardpan, cobbles or other hard material which might prevent the pipe from being uniformly supported is encountered in the bottom of the trench, the trench shall be undercut a minimum of four inches below final grade. The over cut area of the trench will then be filled with sand or fine-grained soil.

BEDDING

The pipe shall be firmly and uniformly bedded throughout its entire length. Bedding material shall be placed and spread in uniform layers and in such a manner as to fill the trench so there are no unfilled spaces below the pipe. For pipe with bell joints, holes shall be dug in the bedding at the bells to permit the body of the pipe to be in contact with the bedding along its entire length. Blocking or mounding shall not be used to bring the pipe up to final grade.

PIPE INSTALLATION

Pipe shall be the diameter, length, material and pressure class as specified on the drawings.

The pipe shall not be dropped into the trench or handled in a manner to cause damage. Individual joints of pipe shall be inspected and any damaged pipe shall be removed and replaced. The pipe will be allowed to come within a few degrees of the temperature it will have after it is completely backfilled before placing fill other than that needed for shading or before connecting the pipe to other facilities.

Hand, mechanical or water packing are optional methods for placing and compacting pipe backfill.

Initial Backfill. The initial backfill material shall be either (1) angular 1 to ¼ inch size crush stone with a maximum of 10 percent cohesive fines or (2) sand and gravels (Soil types GW, GP, SW, and SP) with a maximum particle size of 1 inch containing a maximum of 12 percent of noncohesive fines. Sands shall have a maximum of 45 percent passing the # 40 sieve. The initial backfill materials shall be placed in a

manner as not to displace, deform or damage the pipe. The initial backfill materials shall be placed in four to six inch lifts. Each lift shall be shoveled and tamped between the pipe and the edge of the trench wall. Care shall be taken to assure that all voids are filled under the haunch of the pipe.

When backfilling is done by hand or mechanical means the initial fill shall be compacted firmly around and above the pipe to achieve a soil density equal or greater than the density of the undisturbed side walls of the trench. When water packing is used, the pipe shall be filled with water. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pipe with backfill after consolidation has taken place. Water packing shall be accomplished by adding water to diked reaches of the trench in such quantity as to thoroughly saturate the initial backfill. After the backfill is saturated, the fill shall be consolidated by rodding or with a vibrator. The wetted fill shall be allowed to dry until firm before completing the final backfill. The pipeline shall remain full of water until after the final backfill is placed. Water packing shall be only used on sites with a freely draining subgrade.

Final Backfill. The final backfill material shall be soil or sand free of rocks, frozen clods or other debris larger than 6 inch in diameter. The material shall be placed and spread in approximately uniform layers so there are no unfilled spaces in the backfill. Rolling equipment shall not be used until a minimum of 18 inches of compacted backfill material has been placed over the top of the pipe. Final backfill may be mounded over the top of the trench above ground level, but in no case shall the final backfill be lower than the natural ground along the top of the trench.

All special backfilling requirements of the pipe manufacturer shall be followed.

Cover. The minimum depth for backfill over the top of the pipe shall be 30 inches.

At low places on the ground surface or at locations where it is shallow to rock, extra fill

may be placed over the pipeline to provide the minimum depth of cover. In such cases, the top width of the fill shall be no less than 10 feet and the side slopes no steeper than 6 horizontal to 1 vertical.

Vertical alignment of pipe shall be uniform and such as to maintain the cover requirements unless otherwise noted on the drawings. If irregular grades are required, thrust blocks, air releases, drains and other appurtenances as needed shall be installed.

Thrust Blocks. Thrust blocks shall be formed against a solid trench wall. They shall be of the minimum size and materials as specified on the drawings.

Joints and Connections. All joints and connections shall be constructed to withstand the design working pressure for the pipeline without leakage and shall leave the inside of the pipeline free of any obstruction which could reduce the pipe capacity below design requirements, except that insert fittings for joining PE pipe are permitted.

All fittings, such as couplers, reducers, bends, tees and endives shall be made of material that is recommended for use with the type of pipe specified and shall be installed in accordance with the recommendations of the pipe manufacturer. Fittings made of steel or other materials susceptible to corrosion shall (1) be wrapped with plastic tape meeting the requirements of AWWA C 209 for Type I or II tape, or (2) coated with coal-tar epoxy paint (Kippers-Bitumastic No. 300-M is an approved off the shelf product), or (3) painted with one coat of urethane primer applied at a rate of 2 to 3 mils thick and two or more coats of gloss or semi-gloss Alkyd Enamel to provide a minimum thickness of 6 mils or (4) coated with epoxy paint in accordance with the Steel Structures Council (SSPC) Paint Specification # 16.

Pipelines with solvent welded joints shall have expansion-contraction couplers as indicated on the drawings. Couplers shall have a minimum length of 14 inches.

Solvent for solvent cement joints shall conform to ASTM D 2564 for PVC pipe and fittings, to

ASTM D 2235 for Acrylonitrile-Butadiene-Styrene pipe and fittings.

Rubber gaskets shall conform to ASTM D 3139.

MATERIALS

Quality of Plastic Pipe. The compound used in manufacturing the pipe shall meet the requirements of one of the following materials:

1. Polyvinyl chloride (PVC) as specified in ASTM D 1784 for Type I, Grade 1 or Type I, Grade 2 or Type II, Grade 1.
2. Acrylonitrile-butadiene-styrene (ABS) as specified in ASTM D 1788 for Type I, Grade 2 or Type I, Grade 3 or Type II, Grade 1.
3. Polyethylene (PE) as specified in ASTM D 1248 for Grade P14, Class C or Grade P23, Class C or Grade P33, Class C or Grade P34, Class C.

Pipe shall have a maximum standard dimension ratio (SDR) of 51. Iron pipe size (IPS) plastic pipe and I.D. controlled PE pipe meeting one of the following ASTM specifications are acceptable under this Practice Standard.

ASTM	SPECIFICATION
D 1785	Polyvinyl Chloride Plastic Pipe, Schedule 40, 80 and 120
D 2241	Polyvinyl Chloride Pressure Rated Pipe
D 2672	Joints for IPS PVC Pipe Using Solvent Cement
D 2740	Polyvinyl Chloride Plastic Tubing
D 1527	Acrylonitrile-Butadiene-Styrene Plastic Pipe, Schedules 40 and 80
D 2282	Acrylonitrile-Butadiene-Styrene Plastic Pipe
D2104	Polyethylene Plastic Pipe, Schedule 40
D 2239	Polyethylene Plastic Pipe Based on Controlled Inside Diameter
D 2447	Polyethylene Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
D 2737	Polyethylene Plastic Tubing
D 3035	Polyethylene Plastic Pipe Based on Controlled Outside Diameter
F 771	Polyethylene Thermoplastic High-Pressure Irrigation Pipeline Systems

Plastic irrigation pipe (PIP) shall meet the requirements of ASTM D 2241 or of ASTM D 2282 except that:

1. The outside diameters, wall thicknesses and tolerances in ASAE S376.1 "Design Installation and Performance of Underground, Thermoplastic Irrigation Pipe" shall apply.
2. The minimum burst pressure requirements for water at 23 degrees C for PVC 1120 and 1220 plastic pipe, SDR 51 is 260 lb/in² and for ABS plastic pipe SDR 32.5 and SDR 41 is 380 and 300 lb/in².

Plastic pipe shall be marked with nominal pipe size (for example 10 in), applicable material designation code (for example PVC 1120), pressure rating for water at 23 degrees C, specification designation with which the pipe complies and manufacture's name or trademark.

Valves and Appurtenances. The pipeline valves and appurtenances shall be of the size, type, material and pressure rating as shown on the drawings. Unless otherwise shown on the drawings all Butterfly valves shall be equipped with geared operators.

Air and vacuum relief valves and/or combination air and vacuum relief valves shall be installed at locations shown on the drawings.

Pressure relief valves shall be stamped with the pressure at which the valve starts to open. Adjustable valves shall be sealed or otherwise altered to insure that the setting marked on the valve is not changed.

Check valves shall be rated as quick-closing, non-slamming.

TESTING

When water is available at the time the pipe is installed the system shall be given an operational test. This test shall consist of filling the pipe with water, taking care to bleed of any air in the pipe. All of the system components shall operate without difficulty. Leakage or defects caused by poor materials or workmanship shall be replaced or repaired. When water is not available to complete a test, the installer shall provide a guarantee stating

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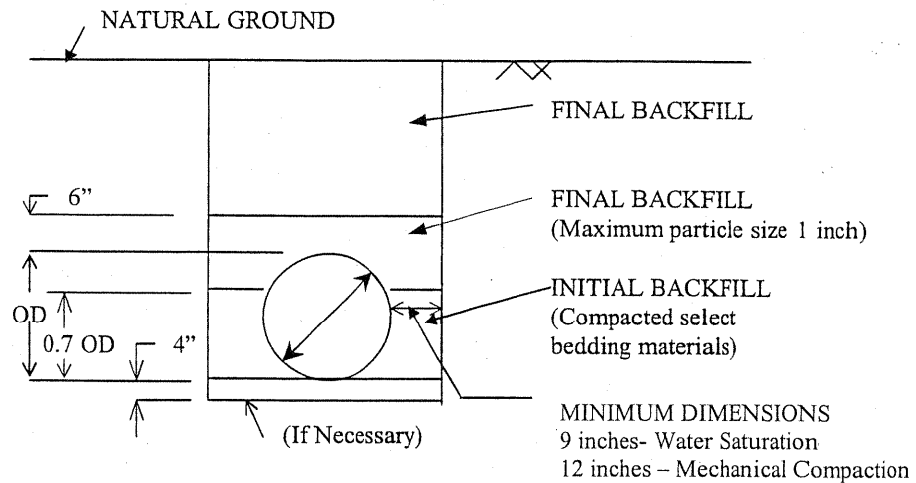
they will return and fix leaks that are found when the pipe is initially filled with water.

GUARANTEE

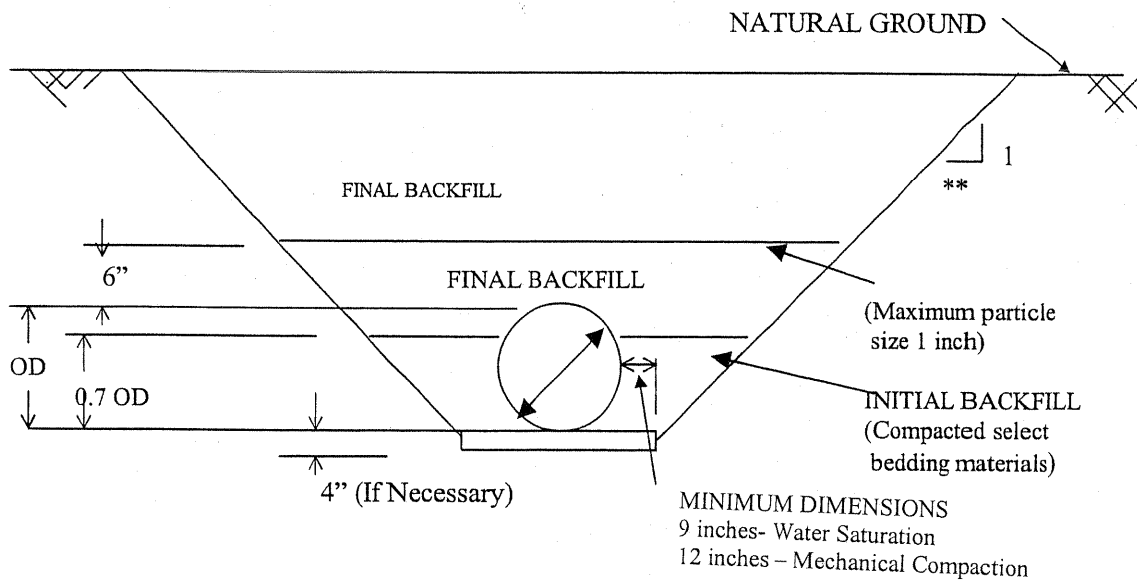
The installing Contractor shall furnish a written guarantee protecting the landowner against defective materials and workmanship for a period of less not than 1 year. The guarantee will identify manufacturer of pipe and pipe markings.

ADDITIONAL SPECIFICATIONS

FIGURE 1
TRENCH WIDTH AND BACKFILL REQUIREMENTS



TYPICAL TRENCH DETAIL
5 FT DEPTH, MAXIMUM



ALTERNATIVE TRENCH DETAIL
DEPTH GREATER THAN 5 FEET

** Slope typically varies from $\frac{3}{4}$ to $1\frac{1}{2}$:1 or greater based upon material classification and other factors such as wetness, vibration, surcharge, etc. Refer to OSHA Subpart P for details.